

PART III

Physical Description

Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have improved limitations through drainage or irrigation.

Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally, this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forest cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan De Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hills country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland which has been glaciated and occupied by the sea in the lowest section. The continental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays known today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High, isolated volcanic cones of lava such as Mt. Adams (12,397 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet) appear upon the older Cascade rocks. The Cascade crest varies between 3,000 and 10,000 feet and is higher across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soils extends in a series of plains, ridges, coulees and hills from the Cascades to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the troughs between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems build since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River Gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and wetter portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

Blue Mountains

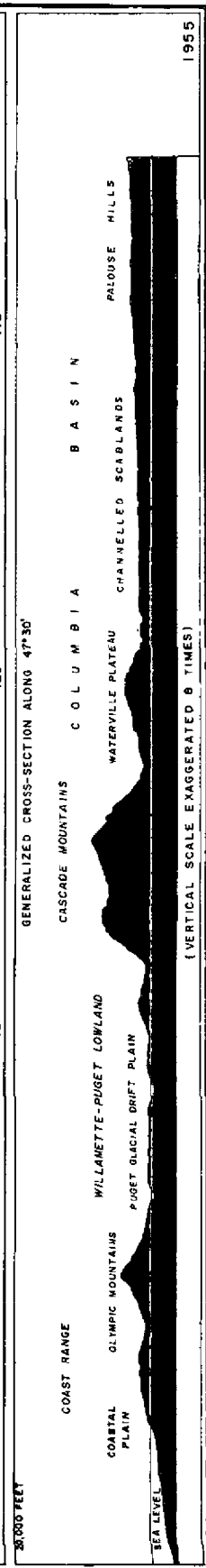
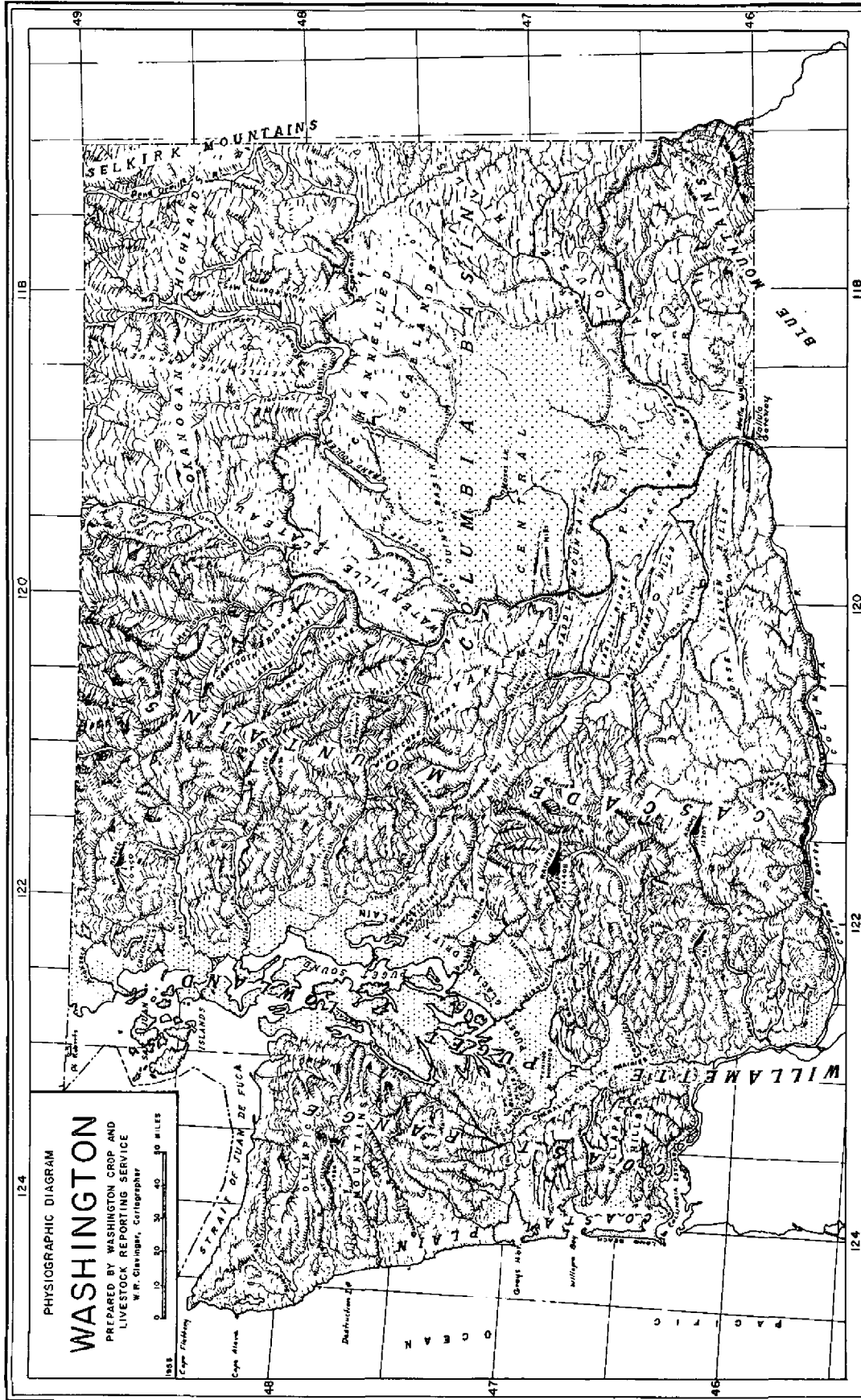
The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

Topography of Klickitat County

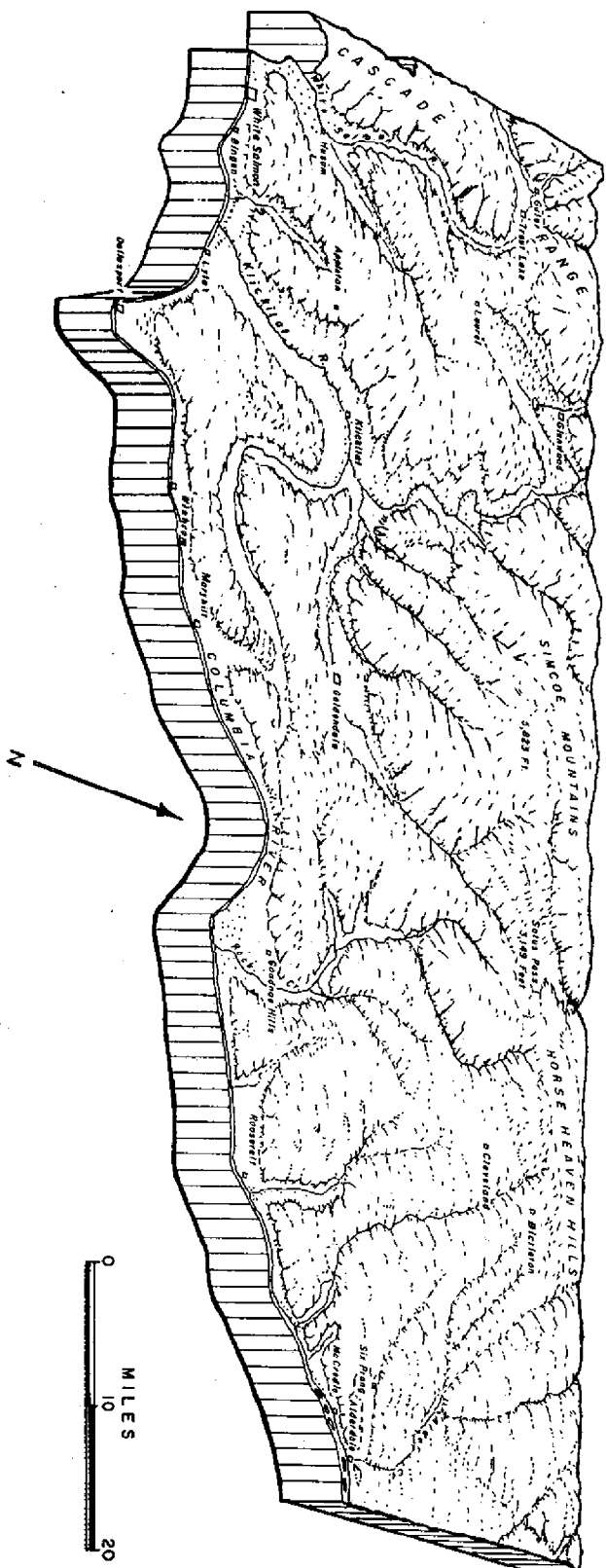
Klickitat County lies on the eastern slope of the Cascade Range and its general topography is one of mountains, plateaus and narrow, valley lowlands. There are four physical units developed for agriculture--the Horse Heaven Hills plateau, the Klickitat River Valley, the White Salmon River Valley and bars and benchlands of the Columbia River Gorge. The gorge of the Columbia, eroded through the Cascade Mountain plateau, is the dominant and most scenic feature of the area. Mountainous features and rough terrain created by stream erosion limit the amount of land available for cultivated crops and a major part of the county is classified as forest and grazing land. Elevations in Klickitat County vary from the average flood level of the Columbia River at White Salmon of 50 feet above sea level to peaks of 5,800 feet in the Simcoe Mountains ridge. Most of the farm land is on elevated plateaus above 1,000 feet in elevation.

The Horse Heaven Hills plateau makes up the eastern third of the county. It is a gently rolling plain that slopes southward to the Columbia River, being a tableland of basalt covered with a mantle of rich volcanic and wind-deposited soil. Terrain is accessible and highly adaptable for mechanized wheat farming on an extensive scale. The plateau is cut by Alder Creek, Glade Creek and Pine Creek. Farm communities, Alderdale, Bickleton, Moonax and Roosevelt are located on the upland. The plateau has an elevation of 3,015 feet at Bickleton and 241 feet at Alderdale on the Columbia River bank.

Klickitat Valley lies in the central part of the county and consists of bottom lands and river benchlands. The main branch of the Klickitat heads in the ice fields of Mount Adams and a second branch has sources in the Simcoe Mountains and Horse Heaven Hills. Lower valley lands are at elevations of 1,100 feet at Goldendale and 263 feet at Klickitat. Most of the accessible farm land of the valley surrounds Goldendale. The Klickitat River descends



TOPOGRAPHIC DIAGRAM
KLICKITAT COUNTY



WASHINGTON CROP AND LIVESTOCK REPORTING SERVICE

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to the Columbia at Lyle through gorges and a narrow valley. Volcanic basalt rock underlays Klickitat Valley and precipitous rock outcroppings exposed by stream cutting and wind erosion are common.

White Salmon Valley is in western Klickitat County. It is a short north-south valley which heads on Mount Adams and descends through basaltic plateaus to the Columbia River. The upper valley contains prairies and basaltic tablelands suited for agriculture. High prairie areas of level and rolling topography surround Guler and Troutlake at an elevation of about 2,000 feet. Another upland prairie area in the upper White Salmon basin is Glenwood, a livestock district, with an average elevation of about 2,100 feet. Some small river bottom areas of about 500 to 700 feet are found near White Salmon. The White Salmon basin has many areas of sloping land suited for fruit farming, but most of the drainage basin is steep-sloping, forested terrain.

The Columbia River Gorge in Klickitat County is called the "North Bank". Most of it is precipitous, basalt cliffs and slopes, rising from a river shore elevation of 50 feet to a height of 2,000 feet. There are numerous small river bar flood plains and benchlands which were flooded periodically in past years as the Columbia River rose and fell as much as 30 feet with the seasons. There are some benchlands at Dallesport, Bingen, Lyle and White Salmon developed for tree fruit, berry and vegetable farming. Construction of hydroelectric and navigation improvement dams: Bonneville, The Dalles and John Day, have equalized the river level and also have flooded some lower bars permanently.

Land Classification and Soils

Klickitat County land is broadly divided into seven general classes. Only about 30 percent of the county area is classified as good to fair land suited for crops and cultivated pastures. About 60 percent is too rough, too high, or too dry and is useful only for forest growth or grazing. About 10 percent is too rocky or too dry even for agricultural or forestry use.

Good Class II land, providing above average returns in farming, is localized in two districts. Largest area is around Bickleton in the higher part of Horse Heaven Hills. This is a dryland wheat district. The terrain is level to rolling. Soils in the Bickleton area are mainly Ritzville loams, a finely textured, wind-deposited (loess) soil which tills easily and is highly retentive of moisture. It is one of three important dryland wheat producing soils of eastern Washington. Another Class II area is southwest of Goldendale, noted for alfalfa, grain and fruit. The soil there is of volcanic rock origin. It is accessible for mechanized methods of farming.

Goldendale and the upper Klickitat Valley contains another wind-deposited soil of coarser nature, the Deschutes series of loams. Deschutes soils have volcanic ash and are suited for grain and alfalfa. It is an important grain growing area which extends into the east Cascade slopes of Oregon, taking its name from Deschutes River Valley, Oregon.

Class III and IV land, ranging from average to low productivity, makes up most of the remaining crop and pasture land. A greater part of Horse Heaven Hills, the Upper Klickitat Valley and Upper White Salmon Basin is Class III

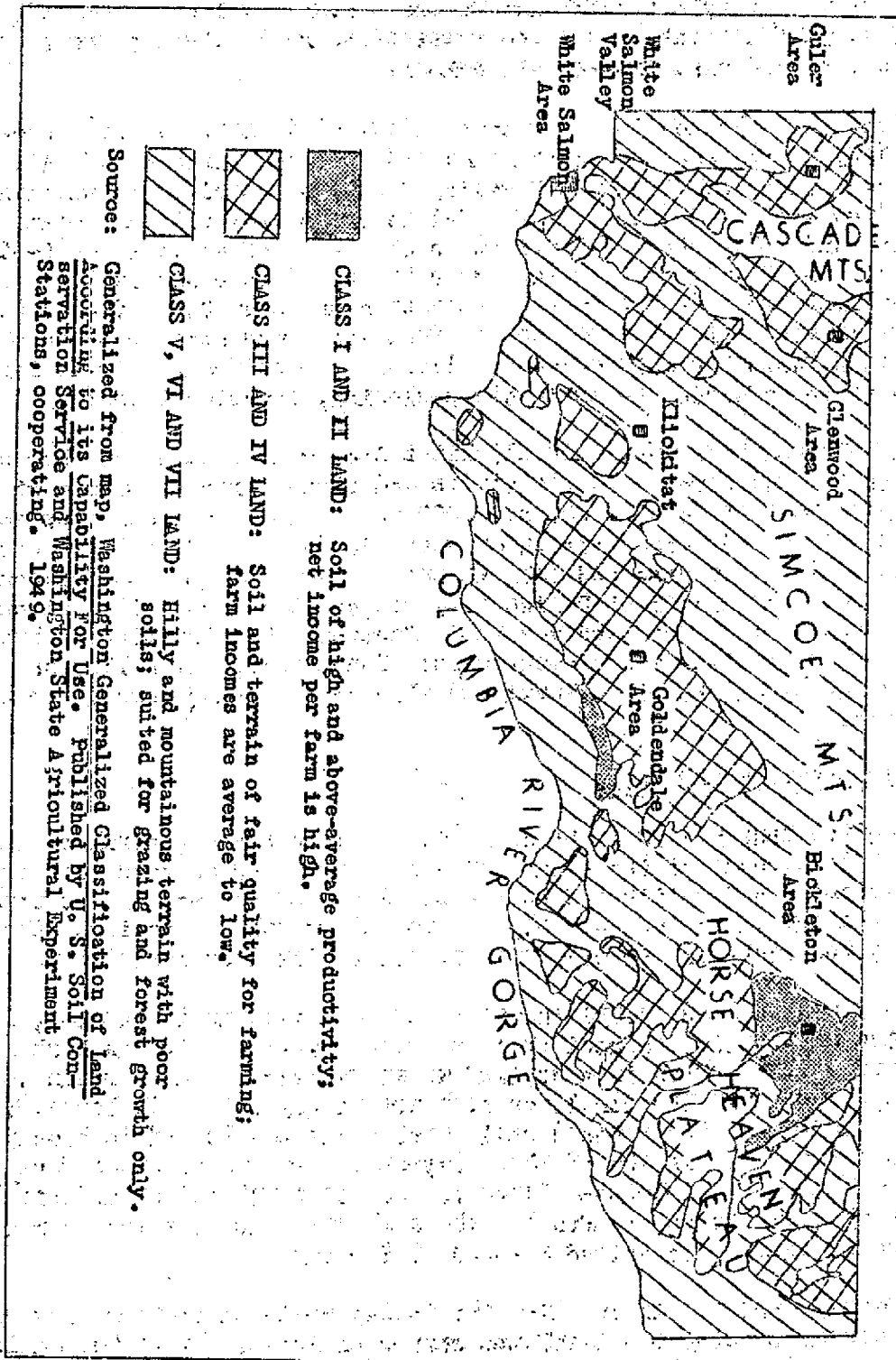


Figure 5.- General Quality of Land in Klickitat County

and IV land containing Ritzville, Deschutes and Aiken loam soils. Steepness of topography, rocky material and dryness of soil are common handicaps. Much of this area is Class III land considered good for hay and fruit.

Nonagricultural and rough grazing or range land is vast in area. It occurs in extensive mountainous and stony areas of the Cascade Mountains, the Simcoe Hills and the Columbia River Gorge with its escarpments, cliffs and rocky slopes.

Climate

Klickitat County's climate varies from a humid, cloudy, western Cascade Mountain belt to a very dry belt in the Horse Heaven Hills in the eastern part of the county. The climate is typical of the eastern Cascade slope of Washington and Oregon with rapid changes in precipitation occurring between the Cascade crest and the lower intermontane basin valleys of the interior. There are two general climates: the Cascade Mountain type and the dry, intermontane basin type.

Precipitation varies from over 50 inches in the Guler-Troutlake district of northwestern Klickitat County to below 12 inches in the Horse Heaven Hills plateau southeast of Bickleton. The White Salmon Valley is in a humid region in the Cascade Mountains receiving 30 to 50 inches. The Klickitat Valley and Goldendale are in a zone of 16 to 30 inches.

As westerly winds descend the east Cascade slope they are warmed and drop less moisture so that by the time they reach Goldendale they are generally dry, evaporating winds. From Goldendale eastward to Bickleton, and further toward Benton County, conditions become progressively dryer. At Alderdale there is an estimated rainfall of about 10 inches and, as a result, eastern Klickitat County is primarily a dryland or summer fallow farming region.

Table 6.- Precipitation for Selected Stations by Months
Klickitat County

Station and Elevation in Feet	Average Monthly Precipitation (in inches)												Annual Total (inches)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Bickleton (3,000)	1.31	1.31	1.07	.73	.54	.84	.09	.32	.32	.82	1.36	1.36	10.89
Dallesport AP (222)	5.80	1.00	.66	T	.46	.45	T	.47	.34	.90	.19	1.32	11.59
Goldendale (1,600)	2.73	1.91	1.32	.83	.85	.59	.21	.26	.67	1.20	2.69	2.96	16.22
Mt. Adams Ranger Station (1,960)	7.13	4.60	4.70	2.41	1.52	1.27	.10	.34	1.09	3.31	6.46	9.24	43.87

Source: U. S. Weather Bureau, Climatological Data, Washington
Annual Summary, 1956

Precipitation has a marked seasonal pattern. October through March is a winter wet season, with snow common in the colder months. The snow provides a protective cover for winter wheat in the Horse Heaven Hills plateau and upper Klickitat Valley. Summers are hot and dry. Summer fallowing of fields is carried out to protect top soil moisture accumulated in the winter. During the dry summers livestock are grazed on Cascade Mountain meadows or on irrigated pastures. Rain and hail showers of local nature are summer risks in the

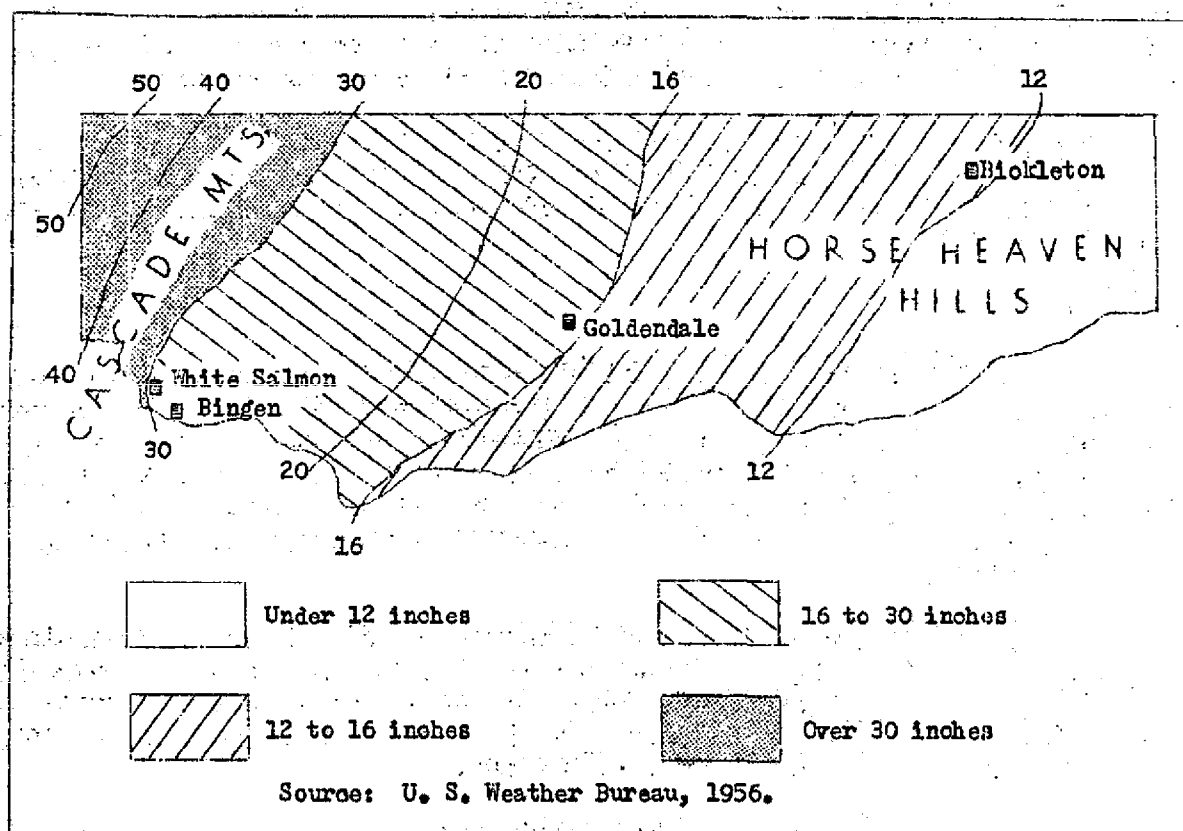


Figure 6.- Distribution of Precipitation
Klickitat County

Columbia River Gorge. Warm, moist ocean air and dry, cold continental air masses often collide violently in the Gorge. In the winter this phenomenon occasionally causes sleet storms and blizzards.

Because of elevation changes, temperature conditions vary from locality to locality. Higher stations and areas such as Bickleton, Goldendale and Mount Adams Ranger Station are cooler and have shorter growing seasons than Dallesport, White Salmon and Lyle on the Columbia River. Upland Klickitat County (above 2,000 feet) has a short growing season and the annual temperature averages about 48 degrees. Columbia River localities have a warmer average of about 53 degrees. At Goldendale, elevation 1,600 feet, the average is about 49 degrees and the growing season is about 175 days. White Salmon Valley, near its juncture with Columbia River, is lowest in elevation and has a growing season of 210 days. Mild Pacific Ocean air and cloudiness extends into Klickitat County to the Dallesport vicinity.

Chinook winds flowing down the eastern Cascade slope are favorable for fruit growing in western Klickitat County. They provide good air drainage and minimize the buildup of heavy frosts in White Salmon, Klickitat and Columbia Gorge lower slope orchard lands. Mild Pacific Ocean air is warmed as it descends from the Cascade crest.

Severe temperature extremes have been recorded at Six Prong in eastern Klickitat and at Goldendale. At Six Prong a record of 113 degrees has been

read as a high and 24 degrees below zero is the lowest temperature recorded. On some occasions cold, continental air flows rapidly oceanward through Columbia Gorge causing rapid freezing. Plantings of peaches and other fruits along the north bank of the Columbia have been damaged and destroyed in past decades by severe winter outbursts of frigid air flowing westward through the Gorge. In summer, hot, dry winds often result in losses to growing crops.

Table 7.- Temperatures For Selected Stations, By Months
Klickitat County

Station and Elevation in Feet	Average Temperatures (in degrees Fahrenheit)												Annual Average
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Bickleton (3,000)	26.8	32.0	39.0	46.0	53.4	59.4	68.2	67.2	60.0	50.4	37.9	31.8	47.7
Dallesport (222)	33.9	31.6	44.9	55.0	63.1	62.6	73.2	70.6	65.4	51.6	40.7	38.1	52.6
Goldendale (1,600)	29.2	34.3	42.2	49.6	54.5	61.9	68.0	66.4	58.8	50.2	38.8	28.2	48.7
Mt. Adams Ranger Station (1,960) 1/	28.8	32.9	40.0	46.8	53.1	59.4	65.8	63.9	57.2	48.1	—	32.4	—

1/ Temperature readings do not cover all months at Mt. Adams Ranger Station.

Source: U. S. Weather Bureau, Climatological Data,
Washington, Annual Summary, 1956

Table 8.- Temperature Extremes, Dates of Killing Frost
Klickitat County

Station and Elevation in Feet	Temperature Extremes Recorded (degrees Fahrenheit)		Killing Frost Average Dates	
	Coldest	Hottest	Last in Spring	First in Fall
Bickleton (3,000)	-11	102	May 17	October 11
Goldendale (1,600)	-29	109	May 17	October 4
Mt. Adams Ranger Station (1,600)	-26	106	June 1	September 13
White Salmon (795)	-14	106	April 17	October 18
Six Prong	-24	113	April 11	October 22

Source: U. S. Weather Bureau

Forest and Wildlife Resources

Klickitat has a varied natural vegetation because of its diverse climate and range of land elevations. Western Klickitat County has a Douglas fir and ponderosa pine forest while the eastern half is semi-arid grassland with sagebrush. Progressing westward up the eastern slopes of the Cascade Mountains, conditions change from a thin to a dense coniferous forest of pines, larches and firs. Climatic conditions favor natural growth of grass and there are several species of wild grasses growing in the open forest country at varied elevations. Much of the forested region is used for summer grazing of sheep and cattle. Federal and State lands are leased for grazing. In 1956 the State of Washington had 42,000 acres on lease to livestockmen.

The first forest survey made in 1936 by the U. S. Forest Service found that 46 percent of Klickitat County was forest land ^{1/}. There were 539,000 acres with 24 forest cover types. Ponderosa pine types predominated, occupying about 70 percent of the forest land. Douglas fir types accounted for 20 percent. Alpine firs of noncommercial types and some lowland hardwoods accounted for about 10 percent.

Nearly 80 percent of Klickitat forest land is privately owned by corporations and individual land owners. Farm forestry is important because of the high proportion of acreage operated by farmers. Major types of forest ownership in the survey of 1936 were as follows: private, 405,000 acres, state and county school lands timber, 70,000 acres, Indian and tribal lands, 41,105 acres, Federal national forest and public domain timber, 9,185 acres.

Lumbering is an important industry at Klickitat, Goldendale, Lyle, White Salmon and Glenwood. Since 1934 there has been a lumber cut of about 100,000,000 board feet per year in 20 mills of various sizes. Logs and pulpwood are also shipped down the Columbia River to other milling districts. In the 1950's logging was increasing; total log cut in Klickitat County was 135,000,000 board feet in 1954.

Summer outdoor recreation in the forested highlands is an increasingly important part of county economy. The White Salmon Valley is the primary recreational area. Tourist travel to Mount Adams for fishing, camping and mountain huckleberry picking contributes to trade at Troutlake, Guler and Glenwood. In the Simcoe Mountains near Satus Pass, many tourists visit Brooks Memorial State Park. Columbia Gorge, with many points of interest such as Maryhill Museum, attracts a tourist trade over Highway 830.

Washington State Game Department reports show the importance of the county's wildlife resources. Stream fishing is good in Klickitat, White Salmon Rivers and their tributaries. Lake fishing attracts many to Troutlake, Northwestern Lake and Pot Hole Lake. Sportsmen come to Klickitat County for big game and upland game bird shooting. In recent years about 5,600 deer have been taken from the forested regions. Several thousand ring-necked pheasants are harvested each season in the grain growing regions of eastern Klickitat County. A few licensed trappers make a small harvest of fur bearers each winter such as muskrat, mink and marten.

^{1/} U. S. Forest Service, Pacific Northwest Experiment Station, Portland, Oregon. Forest Statistics for Klickitat County, Washington. 1936.